**Example Midterm Question:** Match up the following Mathematica inputs to outputs (note that the inputs may or may not contain errors):

<table>
<thead>
<tr>
<th>INPUT:</th>
<th>OUTPUT:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrate[Sin(x), x]</td>
<td>$\int \sin[x] , dx$</td>
</tr>
<tr>
<td>D[Sin[x], x]</td>
<td>$-\cos[x]$</td>
</tr>
<tr>
<td>Integrate[sin[x], x]</td>
<td>$\frac{\sin x^2}{2}$</td>
</tr>
<tr>
<td>D[Sin(x), x]</td>
<td>$\cos[x]$</td>
</tr>
<tr>
<td>Integrate[Sin[x], x]</td>
<td>$\sin$</td>
</tr>
</tbody>
</table>

**Example Midterm Question:** Match up the following Mathematica inputs to outputs (note that the inputs may or may not contain errors):

<table>
<thead>
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<th>INPUT:</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Integrate[2 - 3 x + x^2, x]</td>
<td>Solve::eqf: 2 - 3 x + x^2 is not a well-formed equation</td>
</tr>
<tr>
<td>Solve[2 - 3 x + x^2, x]</td>
<td>$2 - 3x + x^2$</td>
</tr>
<tr>
<td>Integrate[2 - 3 x + x^2, {x,0,1}]</td>
<td>$2x - \frac{3x^2}{2} + \frac{x^3}{3}$</td>
</tr>
<tr>
<td>Solve[2 - 3 x + x^2 == 0, x]</td>
<td>$\frac{5}{6}$</td>
</tr>
<tr>
<td>D[2 - 3 x + x^2]</td>
<td>${{x \rightarrow 1}, {x \rightarrow 2}}$</td>
</tr>
</tbody>
</table>
Example Final Question: Figure out what the following Mathematica simulation does by reading the code and deducing what sort of process is being modeled.

<<Statistics'ContinuousDistributions'

?UniformDistribution

UniformDistribution[min, max] represents the uniform distribution on the interval {min, max}

Clear[num]

num[t_,a_,b_,n0_] := num[t,a,b,n0] = num[t-1,a,b,n0]*Random[UniformDistribution[a,b]]

num[0,a_,b_,n0_] := n0

(a) This model is (circle one each):

Discrete time or continuous time

Deterministic or stochastic

(b) This model is a variant of which model studied in class (circle one):

Exponential growth or Logistic growth or Haploid selection or Spread of disease

(c) Describe a research question that you could address using this simulation program?
**Example Final Question:**  A fellow student has written *Mathematica* code to run a simulation, but is getting very frustrated because *Mathematica* fails to produce a plot. The following codes include three incorrect versions and one correct version. In each case, state whether or not the code would work and, for the codes that do not work, point out the error:

(a) \[
\begin{align*}
x[t_\_, a_\_, b_] :=& \ x[t, a, b] = x[t-1, a, b] + a x[t-1, a, b] / (1 + x[t-1, a, b] \ b) \\
x[0, a_\_, b_] &= 1.0 \\
\text{ListPlot[Table\[ x[t, a, b] \ , \{t, 0, 200}\]]}
\end{align*}
\]

(b) \[
\begin{align*}
x[t_\_, a_\_, b_] :=& \ x[t, a, b] = x[t-1, a, b] + a x[t-1, a, b] / (1 + x[t-1, a, b] \ b) \\
x[0, a_\_, b_] &= 1.0 \\
\text{ListPlot[Table\[ x[t, 0.1, 100] \ , \{t, 0, 200}\]]}
\end{align*}
\]

(c) \[
\begin{align*}
x[t_\_, a_\_, b_] :=& \ x[t, a, b] = x[t, a, b] + a x[t, a, b] / (1 + x[t, a, b] \ b) \\
x[0, a_\_, b_] &= 1.0 \\
\text{ListPlot[Table\[ x[t, 0.1, 100] \ , \{t, 0, 200}\]]}
\end{align*}
\]

(d) \[
\begin{align*}
x[t_\_, a_\_, b_] :=& \ x[t, a, b] == x[t-1, a, b] + a x[t-1, a, b] / (1 + x[t-1, a, b] \ b) \\
x[0, a_\_, b_] &= 1.0 \\
\text{ListPlot[Table\[ x[t, 0.1, 100] \ , \{t, 0, 200}\]]}
\end{align*}
\]